

IN THE CLAIMS

Please amend the claims as follows:

Claim 1 (Currently Amended): A shift control system (~~10~~) having a plurality of successive shift ranges and switching a shift range among said plurality of successive shift ranges via an actuator (~~42~~), comprising:

shift means (~~100~~) driven by said actuator (~~42~~) for switching the shift range;

restriction means (~~110~~) for restricting, in an endmost shift range among said plurality of successive shift ranges, rotation of said actuator (~~42~~) in the direction where no adjacent shift range is present;

rotation control means (~~40~~) for rotating said actuator (~~42~~);

count means (~~46~~) for obtaining a count value according to a relative rotational amount of said actuator (~~42~~); and

position setting means (~~40~~) for setting, when said actuator (~~42~~) is rotated by said rotation control means (~~40~~) in the direction in which rotation of said actuator (~~42~~) is restricted by said restriction means (~~110~~) in said endmost shift range, a reference position of said actuator (~~42~~) corresponding to said endmost shift range based on a state of said count value obtained by said count means (~~46~~).

Claim 2 (Currently Amended): The shift control system (~~10~~) according to claim 1, wherein

said position setting means (~~40~~) includes reference position setting means for setting the reference position of said actuator (~~42~~) by detecting that said count value obtained by said count means (~~46~~) is in a state where a minimum value or a maximum value of said count value is constant for a predetermined period of time.

Claim 3 (Currently Amended): The shift control system (10) according to claim 2, wherein

said position setting means (40) includes reference position setting means for setting a reference position of said actuator (42) corresponding to another shift range different from said endmost shift range, based on a rotatable amount of said actuator (42) between said endmost shift range and said another shift range.

Claim 4 (Currently Amended): The shift control system (10) according to claim 2, wherein

said position setting means (40) includes reference position setting means for setting, when said shift means (100) switches said endmost shift range to another shift range, a reference position of said actuator (42) corresponding to said another shift range.

Claim 5 (Currently Amended): The shift control system (10) according to claim 4, wherein

said position setting means (40) includes detection means for detecting a rotatable amount of said actuator (42) based on the reference position corresponding to said endmost shift range and the reference position corresponding to said another shift range.

Claim 6 (Currently Amended): The shift control system (10) according to claim 2, wherein

said position setting means (40) includes reference position setting means for setting a reference position of said actuator (42) corresponding to another shift range at a predetermined timing in order to correct a backlash due to secular change of said shift means (100) or said restriction means (110).

Claim 7 (Currently Amended): The shift control system (10) according to claim 6,
wherein

said position setting means (40) includes detection means for detecting a rotatable amount of said actuator (42) based on the reference position corresponding to said endmost shift range and the reference position corresponding to said another shift range.

Claim 8 (Currently Amended): The shift control system (10) according to claim 1,
wherein

said position setting means (40) includes reference position setting means for setting a reference position of said actuator (42) corresponding to another shift range different from said endmost shift range, based on a rotatable amount of said actuator (42) between said endmost shift range and said another shift range.

Claim 9 (Currently Amended): The shift control system (10) according to claim 1,
wherein

said position setting means (40) includes reference position setting means for setting, when said shift means (100) switches said endmost shift range to another shift range, a reference position of said actuator (42) corresponding to said another shift range.

Claim 10 (Currently Amended): The shift control system (10) according to claim 9,
wherein

said position setting means (40) includes detection means for detecting a rotatable amount of said actuator (42) based on the reference position corresponding to said endmost shift range and the reference position corresponding to said another shift range.

Claim 11 (Currently Amended): The shift control system (10) according to claim 1, wherein

said position setting means (40) includes reference position setting means for setting a reference position of said actuator (42) corresponding to another shift range at a predetermined timing in order to correct a backlash due to secular change of said shift means (100) or said restriction means (110).

Claim 12 (Currently Amended): The shift control system (10) according to claim 11, wherein

said position setting means (40) includes detection means for detecting a rotatable amount of said actuator (42) based on the reference position corresponding to said endmost shift range and the reference position corresponding to said another shift range.

Claim 13 (Currently Amended): The shift control system (10) according to ~~any of~~ ~~claims 1-12~~ claim 1, wherein

said rotation control means (40) includes means for making smaller an output per unit time of said actuator (42) driven for setting the reference position of said actuator (42) than an output per unit time of said actuator (42) driven for switching the shift range.

Claim 14 (Currently Amended): The shift control system (10) according to ~~any of~~ ~~claims 1-12~~ claim 1, wherein

said position setting means (40) includes setting means for setting, based on said reference position, a target rotational position, to be attained when the shift range is switched, of said actuator (42) in the shift range with said reference position being set.

Claim 15 (Currently Amended): The shift control system (10) according to claim 14, wherein

said rotation control means (40) includes adjustment means for adjusting, when the shift range is switched, the rotational amount of said actuator (42) to allow said actuator (42) to attain said target rotational position by rotating said actuator (42) to drive said shift means (100).

Claim 16 (Currently Amended): A shift control system (10) having a plurality of successive shift ranges and switching a shift range among said plurality of successive shift ranges via an actuator (42), comprising:

- a shift component (100) driven by said actuator (42) for switching the shift range;
- a restriction component (110) for restricting, in an endmost shift range among said plurality of successive shift ranges, rotation of said actuator (42) in the direction where no adjacent shift range is present;
- a rotation control unit (40) for rotating said actuator (42);
- a count unit (46) for obtaining a count value according to a relative rotational amount of said actuator (42); and
- a position setting unit (40) for setting, when said actuator (42) is rotated by said rotation control unit (40) in the direction in which rotation of said actuator (42) is restricted by said restriction unit (110) in said endmost shift range, a reference position of said actuator (42) corresponding to said endmost shift range based on a state of said count value obtained by said count unit (46).

Claim 17 (Currently Amended): The shift control system (10) according to claim 16, wherein

said position setting unit (40) sets the reference position of said actuator (42) by detecting that said count value obtained by said count unit (46) is in a state where a minimum value or a maximum value of said count value is constant for a predetermined period of time.

Claim 18 (Currently Amended): The shift control system (10) according to claim 17, wherein

said position setting unit (40) sets a reference position of said actuator (42) corresponding to another shift range different from said endmost shift range, based on a rotatable amount of said actuator (42) between said endmost shift range and said another shift range.

Claim 19 (Currently Amended): The shift control system (10) according to claim 17, wherein

said position setting unit (40) sets, when said shift component (100) switches said endmost shift range to another shift range, a reference position of said actuator (42) corresponding to said another shift range.

Claim 20 (Currently Amended): The shift control system (10) according to claim 19, wherein

said position setting unit (40) detects a rotatable amount of said actuator (42) based on the reference position corresponding to said endmost shift range and the reference position corresponding to said another shift range.

Claim 21 (Currently Amended): The shift control system (10) according to claim 17, wherein

said position setting unit (40) sets a reference position of said actuator (42) corresponding to another shift range at a predetermined timing in order to correct a backlash due to secular change of said shift component (100) or said restriction component (110).

Claim 22 (Currently Amended): The shift control system (10) according to claim 21, wherein

said position setting unit (40) detects a rotatable amount of said actuator (42) based on the reference position corresponding to said endmost shift range and the reference position corresponding to said another shift range.

Claim 23 (Currently Amended): The shift control system (10) according to claim 16, wherein

said position setting unit (40) sets a reference position of said actuator (42) corresponding to another shift range different from said endmost shift range, based on a rotatable amount of said actuator (42) between said endmost shift range and said another shift range.

Claim 24 (Currently Amended): The shift control system (10) according to claim 16, wherein

said position setting unit (40) sets, when said shift component (100) switches said endmost shift range to another shift range, a reference position of said actuator (42) corresponding to said another shift range.

Claim 25 (Currently Amended): The shift control system (10) according to claim 24, wherein

said position setting unit (40) detects a rotatable amount of said actuator (42) based on the reference position corresponding to said endmost shift range and the reference position corresponding to said another shift range.

Claim 26 (Currently Amended): The shift control system (10) according to claim 16, wherein

said position setting unit (40) sets a reference position of said actuator (42) corresponding to another shift range at a predetermined timing in order to correct a backlash due to secular change of said shift component (100) or said restriction component (110).

Claim 27 (Currently Amended): The shift control system (10) according to claim 26, wherein

said position setting unit (40) detects a rotatable amount of said actuator (42) based on the reference position corresponding to said endmost shift range and the reference position corresponding to said another shift range.

Claim 28 (Currently Amended): The shift control system (10) according to ~~any of~~ ~~claims 16-27~~ claim 16, wherein

said rotation control unit (40) makes smaller an output per unit time of said actuator (42) driven for setting the reference position of said actuator (42) than an output per unit time of said actuator (42) driven for switching the shift range.

Claim 29 (Currently Amended): The shift control system (10) according to ~~any of~~
~~claims 16-27~~ claim 16, wherein

said position setting unit (40) sets, based on said reference position, a target rotational position, to be attained when the shift range is switched, of said actuator (42) in the shift range with said reference position being set.

Claim 30 (Currently Amended): The shift control system (10) according to claim 29, wherein

said rotation control unit (40) adjusts, when the shift range is switched, the rotational amount of said actuator (42) to allow said actuator (42) to attain said target rotational position by rotating said actuator (42) to drive said shift component (100).

Claim 31 (Currently Amended): A shift control method for switching a shift range among a plurality of successive shift ranges via an actuator (42), comprising the steps of:

rotating by said actuator (42) shift means (100) for switching the shift range;

stopping rotation of said actuator (42) by restriction means (110) for restricting, in an endmost shift range among said plurality of successive shift ranges, rotation of said actuator (42) in the direction where no adjacent shift range is present;

detecting a reference position corresponding to said endmost shift range based on a position where said stopping is effected; and

determining, based on said reference position, a target rotational position when the shift range is switched by said actuator (42).

Claim 32 (Currently Amended): A shift control method for switching a shift range among a plurality of successive shift ranges via an actuator (42), comprising the steps of:

rotating by said actuator (42) a shift component (100) for switching the shift range;
stopping rotation of said actuator (42) by a restriction component (110) for restricting, in an endmost shift range among said plurality of successive shift ranges, rotation of said actuator (42) in the direction where no adjacent shift range is present;
detecting a reference position corresponding to said endmost shift range based on a position where said stopping is effected; and
determining, based on said reference position, a target rotational position when the shift range is switched by said actuator (42).

Claim 33 (Currently Amended): A shift range switching device of an automatic transmission mounted on a vehicle, comprising:

shift means (100) for switching a shift position to one of a plurality of successive shift positions by rotating an actuator (42);

storage means for storing said one of shift positions resulting from switching by said shift means (100);

first restriction means for restricting, in a first shift position corresponding to one end position among said plurality of successive shift positions, rotation of said actuator (42) in a direction where no adjacent shift position is present; and

control means (40) for controlling rotation of said actuator (42),

said control means (40) including

first position setting means for setting, as a first reference position in said first shift position, a position where the rotation of said actuator (42) is stopped by said first restriction means,

electric power supply control means for permitting shut-off of electric power supply to said shift range switching device for said first shift position, and

reference position re-setting means for setting again said first reference position by said first position setting means, when electric power supply is resumed after said shut-off of electric power supply, on the condition that said shift position stored in said storage means is unknown.

Claim 34 (Currently Amended): The shift range switching device of an automatic transmission according to claim 33, further comprising second restriction means for restricting, in a second shift position corresponding to the other end position among said plurality of successive shift positions, rotation of said actuator (42) in a direction where no adjacent shift position is present, wherein

said control means (40) further includes

second position setting means for setting, as a second reference position in said second shift position, a position where the rotation of said actuator (42) is stopped by said second restriction means, according to re-setting of said first reference position by said reference position re-setting means, and

movable range calculation means for calculating a movable range of said actuator (42) based on said first reference position re-set by said reference position re-setting means and said second reference position set by said second position setting means.

Claim 35 (Currently Amended): The shift range switching device of an automatic transmission according to claim 34, further comprising count means (46) for obtaining a count value according to a rotational amount of said actuator (42), wherein

said position setting means includes reference position setting means for setting said reference position of said actuator (42) by detecting that said count value obtained by said

count means ~~(46)~~ is in a state where a minimum value or a maximum value of said count value is constant for a predetermined period of time.

Claim 36 (Currently Amended): The shift range switching device of an automatic transmission according to claim 34, wherein

said first restriction means includes means for restricting the rotation of said actuator ~~(42)~~ in said direction where no adjacent shift position is present, in a manner that the rotation of said actuator ~~(42)~~ is restricted in a direction of contracting a detent spring ~~(110)~~, and

said second restriction means includes means for restricting the rotation of said actuator ~~(42)~~ in said direction where no adjacent shift position is present, in a manner that the rotation of said actuator ~~(42)~~ is restricted in a direction of pulling said detent spring ~~(110)~~.

Claim 37 (Currently Amended): The shift range switching device of an automatic transmission according to claim 33, wherein

said control means ~~(40)~~ further includes determination means for determining a first target rotational position to be attained when the shift position is switched by said actuator ~~(42)~~ to said first shift position, based on said first reference position re-set by said reference position re-setting means.

Claim 38 (Currently Amended): The shift range switching device of an automatic transmission according to claim 37, further comprising second restriction means for restricting, in a second shift position corresponding to the other end position among said plurality of successive shift positions, rotation of said actuator ~~(42)~~ in a direction where no adjacent shift position is present, wherein

said control means ~~(40)~~ further includes

second position setting means for setting, as a second reference position in said second shift position, a position where the rotation of said actuator (42) is stopped by said second restriction means, according to re-setting of said first reference position by said reference position re-setting means, and

determination means for determining a second target rotational position to be attained when the shift position is switched by said actuator (42) to said second shift position, based on said second reference position.

Claim 39 (Currently Amended): The shift range switching device of an automatic transmission according to claim 38, further comprising count means (46) for obtaining a count value according to a rotational amount of said actuator (42), wherein

said position setting means includes reference position setting means for setting said reference position of said actuator (42) by detecting that said count value obtained by said count means (46) is in a state where a minimum value or a maximum value of said count value is constant for a predetermined period of time.

Claim 40 (Currently Amended): The shift range switching device of an automatic transmission according to claim 38, wherein

said first restriction means includes means for restricting the rotation of said actuator (42) in said direction where no adjacent shift position is present, in a manner that the rotation of said actuator (42) is restricted in a direction of contracting a detent spring (110), and

said second restriction means includes means for restricting the rotation of said actuator (42) in said direction where no adjacent shift position is present, in a manner that the rotation of said actuator (42) is restricted in a direction of pulling said detent spring (110).

Claim 41 (Currently Amended): The shift range switching device of an automatic transmission according to claim 37, further comprising count means (46) for obtaining a count value according to a rotational amount of said actuator (42), wherein

said position setting means includes reference position setting means for setting said reference position of said actuator (42) by detecting that said count value obtained by said count means (46) is in a state where a minimum value or a maximum value of said count value is constant for a predetermined period of time.

Claim 42 (Currently Amended): The shift range switching device of an automatic transmission according to claim 37, wherein

said first restriction means includes restriction means for restricting the rotation of said actuator (42) in said direction where no adjacent shift position is present, in a manner that the rotation of said actuator (42) is restricted in a direction of contracting a detent spring (110).

Claim 43 (Currently Amended): The shift range switching device of an automatic transmission according to claim 33, further comprising count means (46) for obtaining a count value according to a rotational amount of said actuator (42), wherein

said position setting means includes reference position setting means for setting said reference position of said actuator (42) by detecting that said count value obtained by said count means (46) is in a state where a minimum value or a maximum value of said count value is constant for a predetermined period of time.

Claim 44 (Currently Amended): The shift range switching device of an automatic transmission according to claim 33, wherein

said first restriction means includes restriction means for restricting the rotation of said actuator (42) in said direction where no adjacent shift position is present, in a manner that the rotation of said actuator (42) is restricted in a direction of contracting a detent spring (110).

Claim 45 (Currently Amended): The shift range switching device of an automatic transmission according to ~~any of claims 33-44~~ claim 33, wherein

said first shift position is a P position allowing a parking mechanism to operate by driving said actuator (42), and

said second shift position is a non-P position inhibiting said parking mechanism from operating.

Claim 46 (Currently Amended): A shift range switching device of an automatic transmission mounted on a vehicle, comprising:

a shift component (100) for switching a shift position to one of a plurality of successive shift positions by rotating an actuator (42);

a storage unit for storing said one of shift positions resulting from switching by said shift component (100);

a first restriction component for restricting, in a first shift position corresponding to one end position among said plurality of successive shift positions; rotation of said actuator (42) in a direction where no adjacent shift position is present; and

a control unit (40) for controlling rotation of said actuator (42),

said control unit (40) including

a first position setting unit for setting, as a first reference position of said first shift position, a position where the rotation of said actuator (42) is stopped by said first restriction component,

an electric power supply control unit for permitting shut-off of electric power supply to said shift range switching device for said first shift position, and

a reference position re-setting unit for setting again said first reference position by said first position setting unit, when electric power supply is resumed after said shut-off of electric power supply, on the condition that said shift position stored in said storage unit is unknown.

Claim 47 (Currently Amended): The shift range switching device of an automatic transmission according to claim 46, further comprising a second restriction component for restricting, in a second position corresponding to the other end position among said plurality of successive shift positions, rotation of said actuator (42) in a direction where no adjacent shift position is present, wherein

said control unit (40) further includes

a second position setting unit for setting, as a second reference position of said second shift position, a position where the rotation of said actuator (42) is stopped by said second restriction component, according to re-setting of said first reference position by said reference position re-setting unit, and

a movable range calculation unit for calculating a movable range of said actuator (42) based on said first reference position re-set by said reference position re-setting unit and said second reference position set by said second position setting unit.

Claim 48 (Currently Amended): The shift range switching device of an automatic transmission according to claim 47, further comprising a count unit (46) for obtaining a count value according to a rotational amount of said actuator (42), wherein

said position setting unit sets said reference position of said actuator (42) by detecting that said count value obtained by said count unit (46) is in a state where a minimum value or a maximum value of said count value is constant for a predetermined period of time.

Claim 49 (Currently Amended): The shift range switching device of an automatic transmission according to claim 47, wherein

said first restriction component restricts the rotation of said actuator (42) in said direction where no adjacent shift position is present, in a manner that the rotation of said actuator (42) is restricted in a direction of contracting a detent spring (110), and

said second restriction component restricts the rotation of said actuator (42) in said direction where no adjacent shift position is present, in a manner that the rotation of said actuator (42) is restricted in a direction of pulling said detent spring (110).

Claim 50 (Currently Amended): The shift range switching device of an automatic transmission according to claim 46, wherein

said control unit (40) further includes a setting unit for determining a first target rotational position to be attained when the shift position is switched by said actuator (42) to said first shift position, based on said first reference position re-set by said reference position re-setting unit.

Claim 51 (Currently Amended): The shift range switching device of an automatic transmission according to claim 50, further comprising a second restriction component for

restricting, in a second shift position corresponding to the other end position among said plurality of successive shift positions, rotation of said actuator (42) in a direction where no adjacent shift position is present, wherein

said control unit (40) further includes

a second position setting unit for setting, as a second reference position of said second shift position, a position where the rotation of said actuator (42) is stopped by said second restriction component, according to re-setting of said first reference position by said reference position re-setting unit, and

a setting unit for determining a second target rotational position to be attained when the shift position is switched by said actuator (42) to said second shift position, based on said second reference position.

Claim 52 (Currently Amended): The shift range switching device of an automatic transmission according to claim 51, further comprising a count unit (46) for obtaining a count value according to a rotational amount of said actuator (42), wherein

said position setting unit sets said reference position of said actuator (42) by detecting that said count value obtained by said count unit (46) is in a state where a minimum value or a maximum value of said count value is constant for a predetermined period of time.

Claim 53 (Currently Amended): The shift range switching device of an automatic transmission according to claim 51, wherein

said first restriction component restricts the rotation of said actuator (42) in said direction where no adjacent shift position is present, in a manner that the rotation of said actuator (42) is restricted in a direction of contracting a detent spring (110), and

said second restriction component restricts the rotation of said actuator (42) in said direction where no adjacent shift position is present, in a manner that the rotation of said actuator (42) is restricted in a direction of pulling said detent spring (110).

Claim 54 (Currently Amended): The shift range switching device of an automatic transmission according to claim 50, further comprising a count unit (46) for obtaining a count value according to a rotational amount of said actuator (42), wherein

said position setting unit sets said reference position of said actuator (42) by detecting that said count value obtained by said count unit (46) is in a state where a minimum value or a maximum value of said count value is constant for a predetermined period of time.

Claim 55 (Currently Amended): The shift range switching device of an automatic transmission according to claim 50, wherein

said first restriction component restricts the rotation of said actuator (42) in said direction where no adjacent shift position is present, in a manner that the rotation of said actuator (42) is restricted in a direction of contracting a detent spring (110).

Claim 56 (Currently Amended): The shift range switching device of an automatic transmission according to claim 46, further comprising a count unit (46) for obtaining a count value according to a rotational amount of said actuator (42), wherein

said position setting unit sets said reference position of said actuator (42) by detecting that said count value obtained by said count unit (46) is in a state where a minimum value or a maximum value of said count value is constant for a predetermined period of time.

Claim 57 (Currently Amended): The shift range switching device of an automatic transmission according to claim 46, wherein

said first restriction component restricts the rotation of said actuator (42) in said direction where no adjacent shift position is present, in a manner that the rotation of said actuator (42) is restricted in a direction of contracting a detent spring (110).

Claim 58 (Currently Amended): The shift range switching device of an automatic transmission according to ~~any of claims 46-57~~ claim 46, wherein

said first shift position is a P position allowing a parking mechanism to operate by driving said actuator (42), and

said second shift position is a non-P position inhibiting said parking mechanism from operating.